

|    |   |   |   |  |       |  |                       |   |   |        |      |      |
|----|---|---|---|--|-------|--|-----------------------|---|---|--------|------|------|
|    | A   | B | C | D  | E     | F  | G                     | H | I | J      | K    | L    |
| 1  |   |   |   | Gamma Background Statistics for Data Sets with Non-Detects |       |  |                       |   |   |        |      |      |
| 2  | User Selected Options   |   |   |  |       |  |                       |   |   |        |      |      |
| 3  | Date/Time of Computation  |   |   | 8/2/2013 10:59:30 AM                                       |       |  |                       |   |   |        |      |      |
| 4  | From File   |   |   | WorkSheet.xls  |       |  |                       |   |   |        |      |      |
| 5  | Full Precision  |   |   | OFF  |       |  |                       |   |   |        |      |      |
| 6  | Confidence Coefficient  |   |   | 95%  |       |  |                       |   |   |        |      |      |
| 7  | Coverage  |   |   | 95%  |       |  |                       |   |   |        |      |      |
| 8  |   |   |   |  |       |  |                       |   |   |        |      |      |
| 9  | DDx   |   |   |  |       |  |                       |   |   |        |      |      |
| 10 |   |   |   |  |       |  |                       |   |   |        |      |      |
| 11 | General Statistics  |   |   |  |       |  |                       |   |   |        |      |      |
| 12 | Total Number of Observations  |   |   |  | 46    | Number of Distinct Observations                              |                       |   |   | 46     |      |      |
| 13 | Number of Detects   |   |   |  | 44    | Number of Non-Detects  |                       |   |   | 2      |      |      |
| 14 | Number of Distinct Detects  |   |   |  | 44    | Number of Distinct Non-Detects                               |                       |   |   | 2      |      |      |
| 15 | Minimum Detect  |   |   |  | 0.461 | Minimum Non-Detect   |                       |   |   | 0.94   |      |      |
| 16 | Maximum Detect  |   |   |  | 6.695 | Maximum Non-Detect   |                       |   |   | 0.98   |      |      |
| 17 | Variance Detected   |   |   |  | 1.233 | Percent Non-Detects  |                       |   |   | 4.348% |      |      |
| 18 | Mean Detected   |   |   |  | 2.141 | SD Detected  |                       |   |   | 1.111  |      |      |
| 19 | Mean of Detected Logged Data  |   |   |  | 0.639 | SD of Detected Logged Data                                   |                       |   |   | 0.515  |      |      |
| 20 |   |   |   |  |       |  |                       |   |   |        |      |      |
| 21 | Critical Values for Background Threshold Values (BTVs)  |   |   |  |       |  |                       |   |   |        |      |      |
| 22 | Tolerance Factor K (For UTL)  |   |   |  | 2.079 | d2max (for USL)  |                       |   |   | 2.924  |      |      |
| 23 |   |   |   |  |       |  |                       |   |   |        |      |      |
| 24 | Gamma GOF Tests on Detected Observations Only   |   |   |  |       |  |                       |   |   |        |      |      |
| 25 | A-D Test Statistic  |   |   |  | 0.585 | Anderson-Darling GOF Test                                    |                       |   |   |        |      |      |
| 26 | 5% A-D Critical Value   |   |   |  | 0.753 | ected data appear Gamma Distributed at 5% Significance Level |                       |   |   |        |      |      |
| 27 | K-S Test Statistic  |   |   |  | 0.109 | Kolmogrov-Smirnoff GOF                                       |                       |   |   |        |      |      |
| 28 | 5% K-S Critical Value   |   |   |  | 0.134 | ected data appear Gamma Distributed at 5% Significance Level |                       |   |   |        |      |      |
| 29 | Detected data appear Gamma Distributed at 5% Significance Level   |   |   |  |       |  |                       |   |   |        |      |      |
| 30 |   |   |   |  |       |  |                       |   |   |        |      |      |
| 31 | Kaplan Meier (KM) Background Statistics Assuming Normal Distribution  |   |   |  |       |  |                       |   |   |        |      |      |
| 32 | Mean  |   |   |  | 2.08  | SD   |                       |   |   | 1.112  |      |      |
| 33 | 95% UTL95% Coverage   |   |   |  | 4.392 | 95% KM UPL (t)   |                       |   |   | 3.968  |      |      |
| 34 | 95% KM Chebyshev UPL  |   |   |  | 6.98  | 90% KM Percentile (z)  |                       |   |   | 3.505  |      |      |
| 35 | 95% KM Percentile (z)   |   |   |  | 3.909 | 99% KM Percentile (z)  |                       |   |   | 4.667  |      |      |
| 36 | 95% KM USL  |   |   |  | 5.332 |  |                       |   |   |        |      |      |
| 37 |   |   |   |  |       |  |                       |   |   |        |      |      |
| 38 | Gamma Statistics on Detected Data Only  |   |   |  |       |  |                       |   |   |        |      |      |
| 39 | k hat (MLE)   |   |   |  | 4.235 | k star (bias corrected MLE)                                  |                       |   |   | 3.962  |      |      |
| 40 | Theta hat (MLE)   |   |   |  | 0.506 | Theta star (bias corrected MLE)                              |                       |   |   | 0.54   |      |      |
| 41 | nu hat (MLE)  |   |   |  | 372.7 | nu star (bias corrected)                                     |                       |   |   | 348.6  |      |      |
| 42 | MLE Mean (bias corrected)   |   |   |  | 2.141 |  |                       |   |   |        |      |      |
| 43 | MLE Sd (bias corrected)   |   |   |  | 1.076 | 95% Percentile of Chisquare (2k)                             |                       |   |   | 15.4   |      |      |
| 44 |   |   |   |  |       |  |                       |   |   |        |      |      |
| 45 | Gamma ROS Statistics using Imputed Non-Detects  |   |   |  |       |  |                       |   |   |        |      |      |
| 46 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs                |   |   |  |       |  |                       |   |   |        |      |      |
| 47 | GROS may not be used when kstar of detected data is small such as < 0.1                                     |   |   |  |       |  |                       |   |   |        |      |      |
| 48 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs                            |   |   |  |       |  |                       |   |   |        |      |      |
| 49 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates |   |   |  |       |  |                       |   |   |        |      |      |
| 50 | Minimum   |   |   |  | 0.461 | Mean   |                       |   |   | 2.077  |      |      |
| 51 | Maximum   |   |   |  | 6.695 | Median   |                       |   |   | 2.064  |      |      |
| 52 | SD  |   |   |  | 1.127 | CV   |                       |   |   | 0.543  |      |      |
| 53 | k hat (MLE)   |   |   |  | 3.795 | k star (bias corrected MLE)                                  |                       |   |   | 3.562  |      |      |
| 54 | Theta hat (MLE)   |   |   |  | 0.547 | Theta star (bias corrected MLE)                              |                       |   |   | 0.583  |      |      |
| 55 | nu hat (MLE)  |   |   |  | 349.2 | nu star (bias corrected)                                     |                       |   |   | 327.7  |      |      |
| 56 | MLE Mean (bias corrected)   |   |   |  | 2.077 | MLE Sd (bias corrected)                                      |                       |   |   | 1.101  |      |      |
| 57 | 95% Percentile of Chisquare (2k)  |   |   |  | 14.25 | 90% Percentile   |                       |   |   | 3.553  |      |      |
| 58 | 95% Percentile  |   |   |  | 4.154 | 99% Percentile   |                       |   |   | 5.446  |      |      |
| 59 | The following statistics are computed using Gamma ROS Statistics on Imputed Data                            |   |   |  |       |  |                       |   |   |        |      |      |
| 60 | Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods                                     |   |   |  |       |  |                       |   |   |        |      |      |
| 61 |   |   |   |  | WH    | HW   |                       |   |   |        | WH   | HW   |
| 62 | Approx. Gamma UTL with 95% Coverage   |   |   |  | 4.881 | 5.016  | 95% Approx. Gamma UPL |   |   |        | 4.19 | 4.26 |

|    |   |   |   |   |            |       |                       |   |   |   |   |             |       |
|----|---|---|---|---|------------|-------|-----------------------|---|---|---|---|-------------|-------|
|    | A   | B | C | D | E          | F     | G                     | H | I | J | K | L           |       |
| 63 | 95% Gamma USL   |   |   |   | 6.67       | 7.043 |                       |   |   |   |   |             |       |
| 64 |   |   |   |   |            |       |                       |   |   |   |   |             |       |
| 65 | The following statistics are computed using gamma distribution and KM estimates                         |   |   |   |            |       |                       |   |   |   |   |             |       |
| 66 | Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods                                 |   |   |   |            |       |                       |   |   |   |   |             |       |
| 67 |   |   |   |   | k hat (KM) | 3.496 |                       |   |   |   |   | nu hat (KM) | 321.7 |
| 68 |   |   |   |   | WH         | HW    |                       |   |   |   |   | WH          | HW    |
| 69 | Approx. Gamma UTL with 95% Coverage   |   |   |   | 4.831      | 4.961 | 95% Approx. Gamma UPL |   |   |   |   | 4.155       | 4.222 |
| 70 | 95% Gamma USL   |   |   |   | 6.58       | 6.939 |                       |   |   |   |   |             |       |
| 71 |   |   |   |   |            |       |                       |   |   |   |   |             |       |
| 72 | Note: The use of USL to estimate a BTV is recommended only when the data set represents a background    |   |   |   |            |       |                       |   |   |   |   |             |       |
| 73 | data set free of outliers and consists of observations collected from clean unimpacted locations.       |   |   |   |            |       |                       |   |   |   |   |             |       |
| 74 | The use of USL tends to provide a balance between false positives and false negatives provided the data |   |   |   |            |       |                       |   |   |   |   |             |       |
| 75 | represents a background data set and when many onsite observations need to be compared with the BTV.    |   |   |   |            |       |                       |   |   |   |   |             |       |
| 76 |   |   |   |   |            |       |                       |   |   |   |   |             |       |